

# NTMS4872N

## Power MOSFET

30 V, 10.2 A, N-Channel, SO-8

### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- SOIC-8 Surface Mount Package Saves Board Space
- This is a Pb-Free Device

### Applications

- Disk Drives
- DC-DC Converters
- Printers

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DSS}$	30	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	$I_D$	8.0	A
		$T_A = 70^{\circ}\text{C}$		6.4	
Power Dissipation $R_{\theta JA}$ (Note 1)		$T_A = 25^{\circ}\text{C}$	$P_D$	1.49	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		$T_A = 25^{\circ}\text{C}$	$I_D$	6.0	A
		$T_A = 70^{\circ}\text{C}$		4.8	
Power Dissipation $R_{\theta JA}$ (Note 2)		$T_A = 25^{\circ}\text{C}$	$P_D$	0.82	W
Continuous Drain Current $R_{\theta JC}$ , $t \leq 10$ s (Note 1)		$T_C = 25^{\circ}\text{C}$	$I_D$	10.2	A
		$T_C = 70^{\circ}\text{C}$		8.2	
Power Dissipation $R_{\theta JC}$ , $t \leq 10$ s (Note 1)		$T_C = 25^{\circ}\text{C}$	$P_D$	2.4	W
Pulsed Drain Current		$T_A = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$		$I_{DM}$	56
Operating Junction and Storage Temperature			$T_J$ , $T_{stg}$	-55 to 150	$^{\circ}\text{C}$
Source Current (Body Diode)			$I_S$	2.4	A
Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^{\circ}\text{C}$ , $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_L = 7.0\text{ A}_{pk}$ , $L = 1.0\text{ mH}$ , $R_G = 25\text{ }\Omega$ )			$E_{AS}$	24.5	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			$T_L$	260	$^{\circ}\text{C}$

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	84	$^\circ\text{C/W}$
Junction-to-Ambient – $t \leq 10$ s (Note 1)	$R_{\theta JA}$	52	
Junction-to-Foot (Drain)	$R_{\theta JF}$	22.5	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	153	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surfacemounted on FR4 board using 1 sq-in pad, 2 oz Cu.
2. Surfacemounted on FR4 board using the minimum recommended pad size.



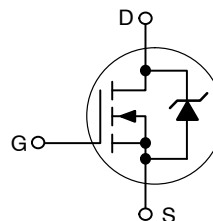
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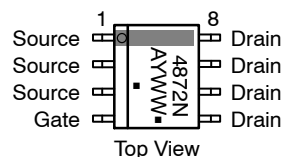
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	13.5 m $\Omega$ @ 10 V	10.2 A
	16.5 m $\Omega$ @ 4.5 V	

### N-Channel



SO-8  
CASE 751  
STYLE 12

### MARKING DIAGRAM/ PIN ASSIGNMENT



4872N = Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTMS4872NR2G	SO-8 (Pb-Free)	2500/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NTMS4872N

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			13		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 24 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 100°C		10	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.45		2.5	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			5.8		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10.2 A		9.4	13.5	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 9.3 A		13.5	16.5	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 1.5 V, I <sub>D</sub> = 10.2 A		21		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 15 V		1136	1700	pF
Output Capacitance	C <sub>oss</sub>			240	370	
Reverse Transfer Capacitance	C <sub>rss</sub>			130	200	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10.2 A		10	15	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			1.3		
Gate-to-Source Charge	Q <sub>GS</sub>			3.4	5.0	
Gate-to-Drain Charge	Q <sub>GD</sub>			3.8	5.5	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10.2 A		20	30	nC

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10.2 A, R <sub>G</sub> = 6.0 Ω		10	15	ns
Rise Time	t <sub>r</sub>			22	35	
Turn-Off Delay Time	t <sub>d(off)</sub>			23	35	
Fall Time	t <sub>f</sub>			5.7	9.0	

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2.4 A	T <sub>J</sub> = 25°C	0.76	1.0	V
			T <sub>J</sub> = 125°C	0.6		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 10.2 A		17.5	27	ns
Charge Time	t <sub>a</sub>			8.5	13	
Discharge Time	t <sub>b</sub>			9.0	14	
Reverse Recovery Charge	Q <sub>RR</sub>			6.5	10	nC

### PACKAGE PARASITIC VALUES

Source Inductance	L <sub>S</sub>	T <sub>A</sub> = 25°C		0.66		nH
Drain Inductance	L <sub>D</sub>			0.20		nH
Gate Inductance	L <sub>G</sub>			1.5		nH
Gate Resistance	R <sub>G</sub>			1.5	2.3	Ω

3. Pulse Test: pulse width = 300 μs, duty cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

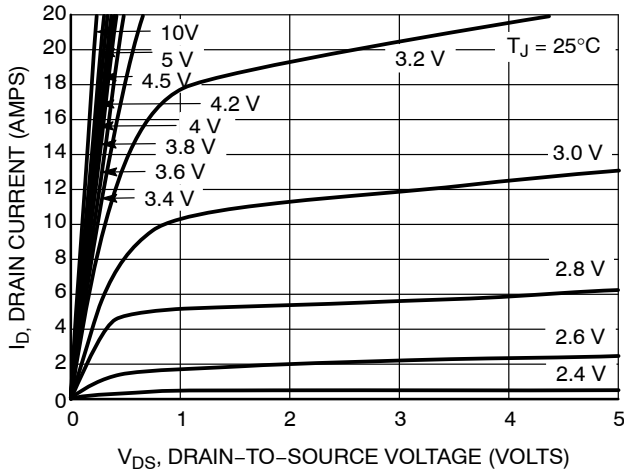


Figure 1. On-Region Characteristics

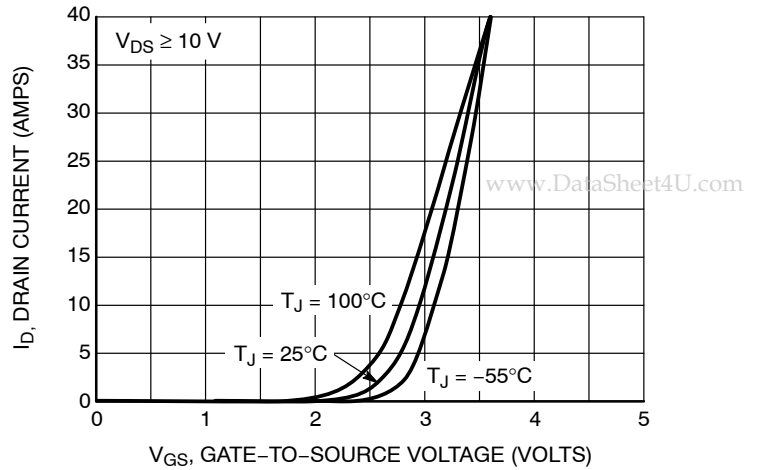


Figure 2. Transfer Characteristics

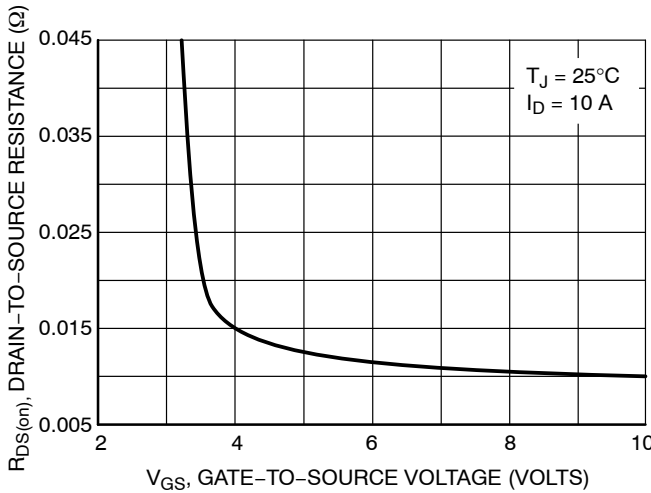


Figure 3. On-Resistance vs. Gate-to-Source Voltage

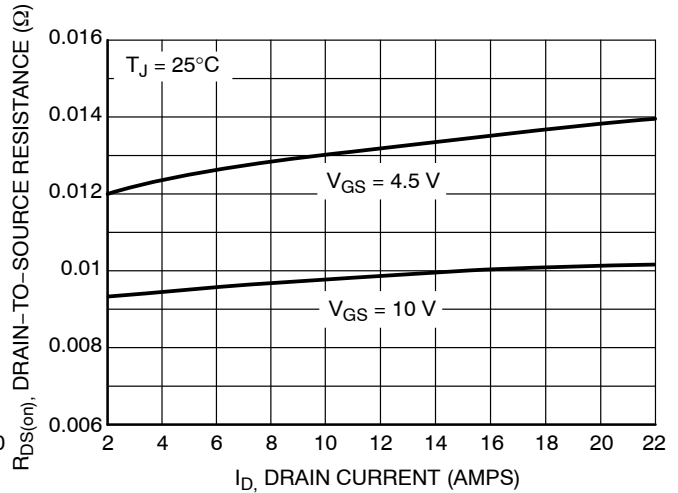


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

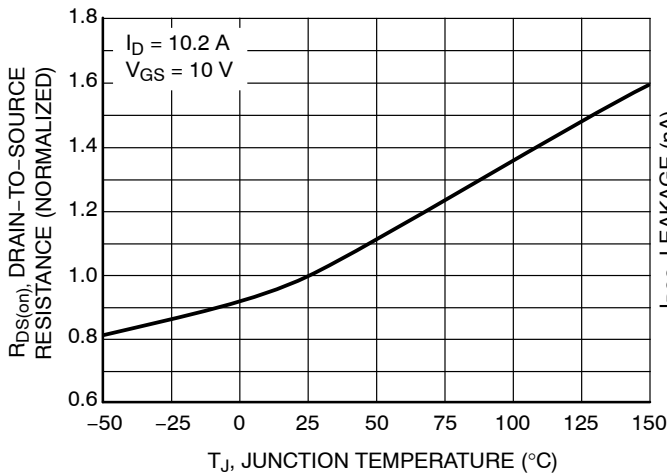


Figure 5. On-Resistance Variation with Temperature

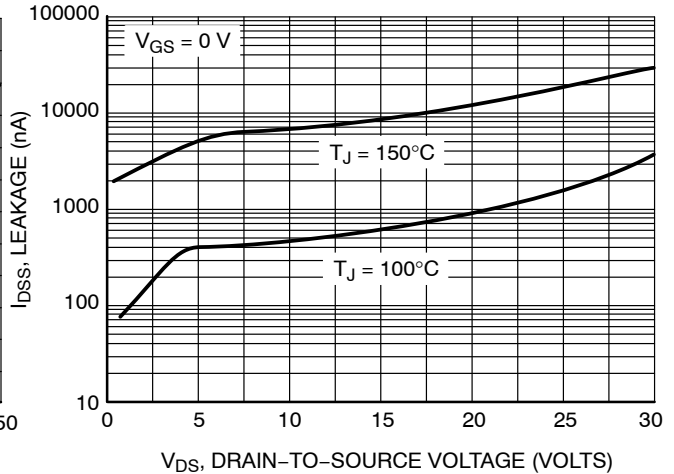


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

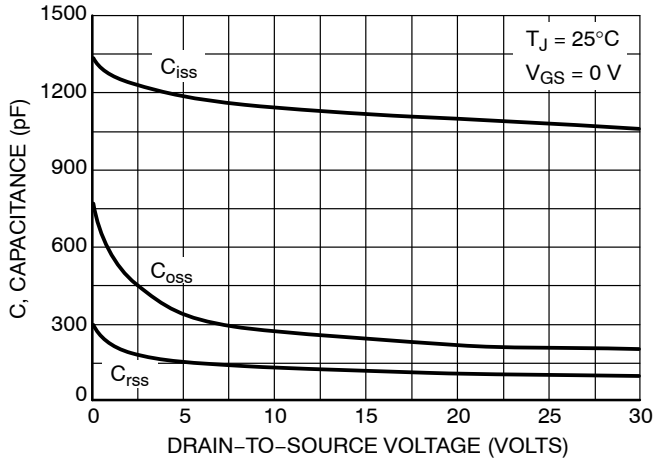


Figure 7. Capacitance Variation

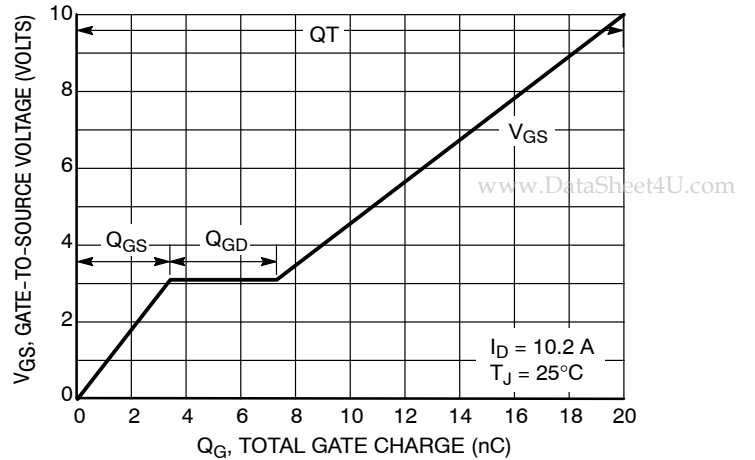


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

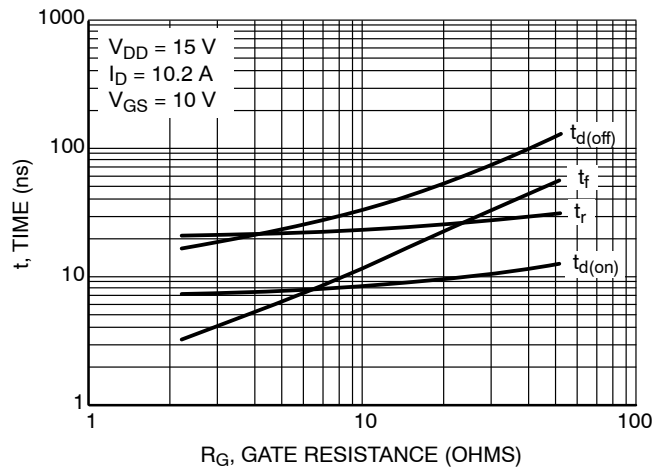


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

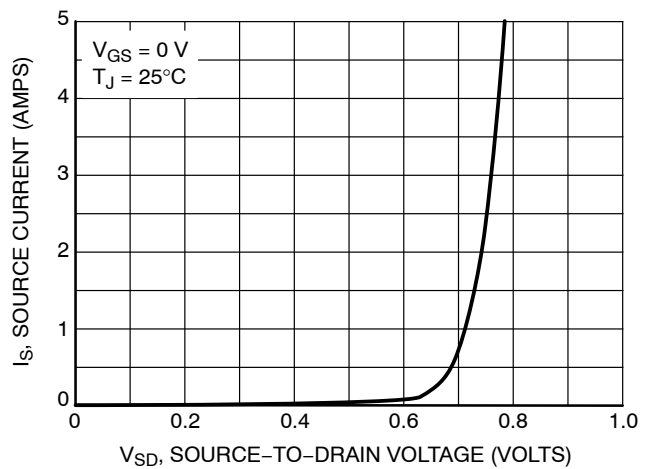


Figure 10. Diode Forward Voltage vs. Current

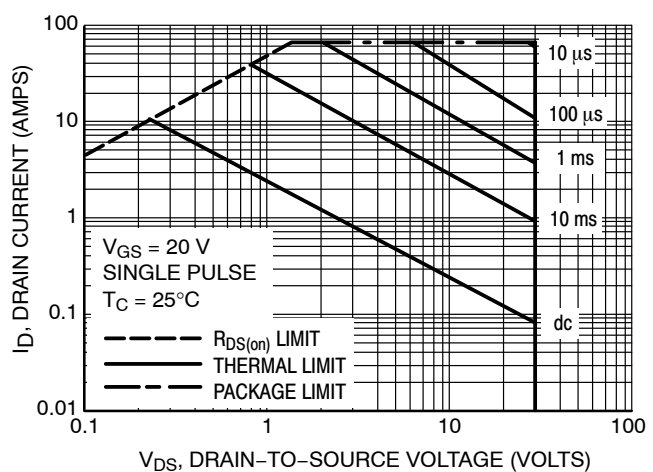


Figure 11. Maximum Rated Forward Biased Safe Operating Area

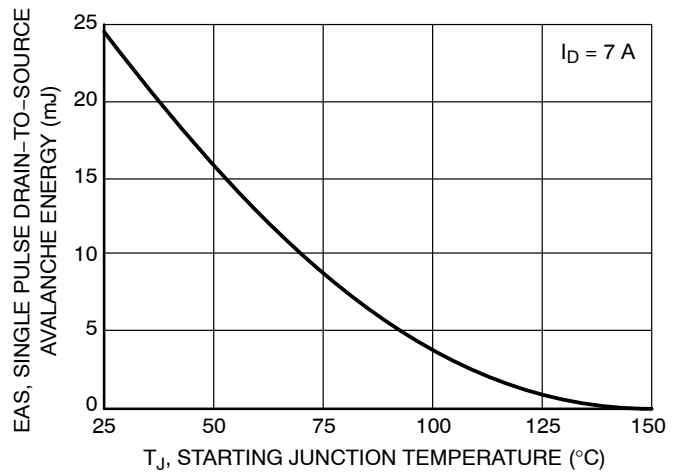
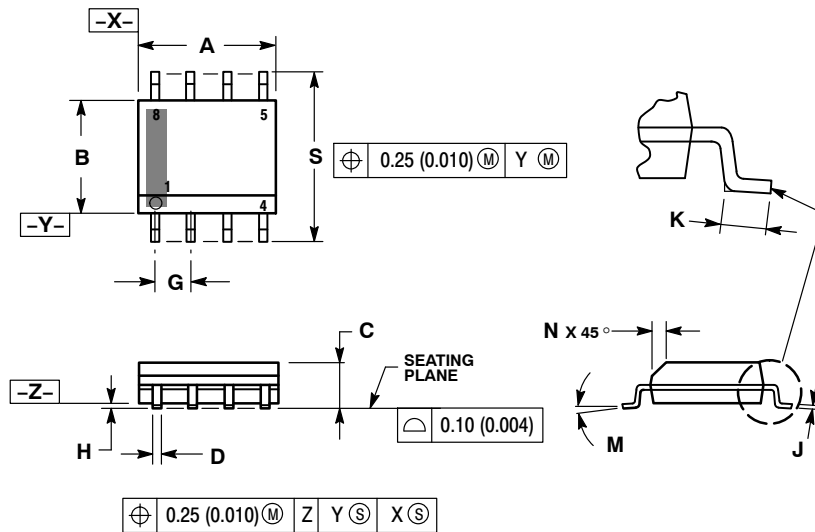


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

# NTMS4872N

## PACKAGE DIMENSIONS

SOIC-8  
CASE 751-07  
ISSUE AJ

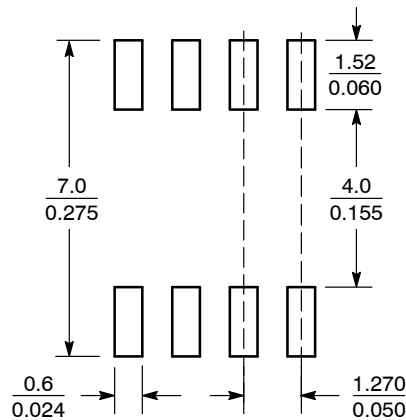


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### SOLDERING FOOTPRINT\*



SCALE 6:1 (mm/inches)

### STYLE 12:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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